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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/749,739

12/30/2003

Rex K. Frost

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9018

7590

03/29/2005

Michael A. Bernadicou
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Seventh Floor
12400 Wilshire Boulevard
Los Angeles, CA 90025

EXAMINER

DANG, PHUC T

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 03/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

12

Office Action Summary	Application No. 10/749,739	Applicant(s) FROST ET AL	
	Examiner PHUC T. DANG	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 December 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 6, 7, 10, 12, 19, 20 and 23-28 is/are rejected.
- 7) ☒ Claim(s) 3-5, 8, 9, 11, 13-18, 21, 22 and 29-31 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Oath/Declaration

1. The oath/declaration filed on December 30, 2003 is acceptable.

Specification

2. The specification has been checked to the extent necessary to determine the presence of all possible minor errors. However, the applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

3. Claims 9 and 27 are objected to because of the following informalities:

In claim 1, lines 1-2, claim 9 is indefinite because claim 9 is not depend on any claim.

In claim 27, line 1, "surfactant." Should amend to -- surfactant, --.

Claim Rejections - 35 USC § 102

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

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4. Claims 1-2, 6-7, and 19 are rejected under 35 U.S.C. 102 (b) as being anticipated by Yoshii (U.S. Patent No. 6,210,868 B1).

Regarding claims 1-2, 7 and 19, Yoshii discloses a method for controlling a photoresist layer above a substrate comprising:

forming, exposing, and developing the photoresist layer (13, Fig. 2) forming at least one opening (W1, Fig. 2) having a first dimension (Fig. 2);

exposing the photoresist layer (13, Fig. 3) with the at least one opening to a solvent (15, Fig. 3); and

heating the photoresist layer (13, Fig. 3) with the at least one opening (W1, Fig. 3), after exposing the photoresist layer to the solvent (15, Fig. 3), to achieve a thermal reflow of the photoresist layer to modify the dimension of the at least one opening (W2, Fig. 4) in the photoresist layer (13, Fig. 4) [col. 3, lines 44-55].

Regarding claim 6, Yoshii discloses a step of controlling the heating of the photoresist layer to modify the dimension of the at least one opening (W1, Fig. 3) in the photoresist layer (13, Fig. 3) decreases the dimension of the opening (W2, Fig. 4) in the photoresist layer (13, Fig. 4).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary

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skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 10, 12, 20 and 23-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshii in view of Choi et al., hereinafter "Choi" (U.S. Patent No. 6,485,895 B1).

Regarding claims 10 and 12, Yoshii discloses the features of the claimed invention as discussed above, but does not disclose the solvent is a relatively low polarity solvent and a low-molecular weight polymer.

Choi, however, discloses the solvent is a relatively low polarity solvent [col. 6, lines 14-17] and a low-molecular weight polymer [col. 5, lines 31-35].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the above teaching of Yoshii as taught by Choi for a purpose of providing excellent controllability of the dimension [col. 2, lines 19-20].

Regarding claim 20, Yoshii discloses the features of the claimed invention as discussed above, but does not disclose the photoresist layer with the at least one opening is exposed to a solvent for between 30 seconds and 2 minutes prior to heating the photoresist to reflow.

However, Choi discloses the photoresist layer with the at least one opening is exposed to a solvent for between 30 seconds and 2 minutes prior to heating the photoresist to reflow [col. 17, lines 36-42].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the above teaching of Yoshii as taught by Choi for a purpose of providing excellent controllability of the dimension [col. 2, lines 19-20].

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Regarding claims 23-24, Yoshii discloses the features of the claimed invention as discussed above, but does not disclose a step of controlling the heating is performed at a temperature between 125 to 175 degrees Centigrade for 60 to 90 seconds.

However, Choi discloses a step of controlling the heating is performed at a temperature between 125 to 175 degrees Centigrade for 60 to 90 seconds [col. 17, lines 36-42].

It would have been obvious to one having ordinary skilled in the art at the time the invention was made to modify the above teaching of Yoshii as taught by Choi for a purpose of providing excellent controllability of the dimension [col. 2, lines 19-20].

Regarding claim 25, Yoshii discloses the features of the claimed invention as discussed above, but does not disclose a step of controlling the heating controls the formation of a photoresist layer critical dimension.

However, Choi discloses a step of controlling the heating controls the formation of a photoresist layer critical dimension [col. 2, lines 5-12].

It would have been obvious to one having ordinary skilled in the art at the time the invention was made to modify the above teaching of Yoshii as taught by Choi for a purpose of providing excellent controllability of the dimension [col. 2, lines 19-20].

Regarding claim 26, Yoshii discloses claim 26 is similar to claims 1 and 7 above, except for a step of subjecting the photoresist layer with at least one opening to an etch process, subsequently forming an integrated circuit features.

Choi, however, discloses a step of subjecting the photoresist layer with at least one opening to an etch process, subsequently forming an integrated circuit features [col. 5, lines 59-64].

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It would have been obvious to one having ordinary skilled in the art at the time the invention was made to modify the above teaching of Yoshii as taught by Choi for a purpose of providing excellent controllability of the dimension [col. 2, lines 19-20].

Regarding claim 27, Yoshii discloses the features of the claimed invention as discussed above, but does not disclose the solvent is a surfactant, a relatively low- polarity solvent, or a low-molecular weight polymer.

However, Choi discloses the solvent is a surfactant, a relatively low- polarity solvent, or a low-molecular weight polymer [col. 5, lines 31-35].

It would have been obvious to one having ordinary skilled in the art at the time the invention was made to modify the above teaching of Yoshii as taught by Choi for a purpose of providing excellent controllability of the dimension [col. 2, lines 19-20].

Regarding claim 28, Yoshii discloses the features of the claimed invention as discussed above, but does not disclose the solvent is a Propylene Glycol Monomethyl Ether Acetate (PGMEA) solvent.

However, Choi discloses the solvent is a Propylene Glycol Monomethyl Ether Acetate (PGMEA) solvent [col. 13, lines 58+].

It would have been obvious to one having ordinary skilled in the art at the time the invention was made to modify the above teaching of Yoshii as taught by Choi for a purpose of providing excellent controllability of the dimension [col. 2, lines 19-20].

Allowable Subject Matter

6. The following is a statement of reason for the indication of allowable subject matter:

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Claims 3-5, 8, 11, 13-18, 21-22 and 29-31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

None of the Prior Art made of record discloses a step of exposing the photoresist layer with the at least one opening to a solvent causes a mitigation of bulk expansion of the photoresist layer during reflow as cited in claim 3 and heating the photoresist layer with the at least one opening to achieve a thermal reflow controls the formation of a critical dimension that is less than the resolution of a lithographic tool set as cited in claim 4 and heating the photoresist layer with the at least one opening to achieve a thermal reflow controls the formation of a critical dimension that is less than the fundamental resolution of the photoresist layer as cited in claim 5 and the solvent is a surfactant as cited in claim 8 and the solvent is selected from the group dichloro-methane, acetonitrile, and isopropanol as cited in claim 11 and the solvent is selected from the group Teflon, polystyrene, and polyethylene as cited in claim 13 and the solvent is a gas or vapor as cited in claim 14 and the solvent is dissolved at a 0.1 to 3 percent (%) concentration as cited in claim 21 and the solvent is dissolved into a secondary liquid in which the resist film is not soluble as cited in claim 22 and a step of heating the photoresist layer with the at least one opening to achieve a thermal reflow controls the formation of an etch ready critical dimension as cited in claim 29 and heating the photoresist layer with the at least one opening to achieve a thermal reflow controls the formation of an etch ready critical dimension that is less than the resolution of a lithographic tool set as cited in claim 30 and heating the photoresist layer with the at least one opening to achieve a thermal reflow controls the formation of an etch ready critical

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dimension that is less than the fundamental resolution of the photoresist layer as cited in claim 31.

Claims 15-18 are dependent on claim 14, then, they also would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

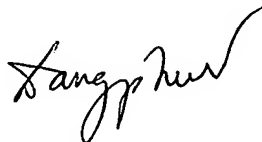
7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phuc T. Dang whose telephone number is (571) 272-1776. The examiner can normally be reached on 8:00 am-5:00 pm.

8. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David C. Nelms can be reached on (571) 272-1787. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9306 for regular communications and After Final communications.

9. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Phuc T. Dang

PD



Primary Examiner

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